ZooKeys 35: 1–12 (2010)
doi: 10.3897/zookeys.35.329
www.pensoftonline.net/zookeys

RESEARCH ARTICLE

A peer-reviewed open-access journal
ZooKeys
Launched to accelerate biodiversity research

A remarkable new species of *Himalusa* Pace from Thailand (Coleoptera, Staphylinidae, Aleocharinae): phytophagous aleocharine beetle with potential for bio-control of skunkvine-related weeds in the United States

Jan Klimaszewski[1,†], Roberto Pace[2,‡], Ted D. Center[3,§], Jérôme Couture[1,|]

1 *Natural Resources Canada, Canadian Forest Service, Laurentian Forestry Centre, 1055 du P.E.P.S., P.O. Box 10380, Stn. Sainte-Foy, Quebec, QC, Canada G1V 4C7* **2** *Via Vittorio Veneto 13, 37032 Monteforte d'Alpone, Verona, Italy* **3** *Invasive Plant Research Laboratory, Agricultural Research Service, United States Department of Agriculture, 3225 College Ave., Fort Lauderdale, FL 33314, USA*

† *urn:lsid:zoobank.org:author:75880C14-430B-45F6-8B6D-840428F3FF37*
‡ *urn:lsid:zoobank.org:author:33B88CE6-5267-4748-8873-C0F18F2EBCA9*
§ *urn:lsid:zoobank.org:author:15D223BA-173E-4538-94E3-25D613A38C6D*
| *urn:lsid:zoobank.org:author:4EDBB025-0045-4F0B-9423-DDD92B0C82D5*

Corresponding author: *Jan Klimaszewski* (jan.klimaszewski@nrcan-rncan.gc.ca)

Academic editor: *Terry Erwin* | Received 17 November 2009 | Accepted 23 December 2009 | Published 2 February 2010

urn:lsid:zoobank.org:pub:3DD6CF0A-55ED-4BF6-9E5C-4F40968D9B81

Citation: Klimaszewski J, Pace R, Center TD, Couture J (2010) A remarkable new species of *Himalusa* Pace from Thailand (Coleoptera, Staphylinidae, Aleocharinae): phytophagous aleocharine beetle with potential for bio-control of skunkvine-related weeds in the United States. ZooKeys 35: 1–12. doi: 10.3897/zookeys.35.329

Abstract

A new aleocharine species, *Himalusa thailandensis* Pace, Klimaszewski & Center **sp. n.**, found feeding on sewer vine, *Paederia pilifera* Hook. f., in Thailand, is described and illustrated. This is the first record of the genus *Himalusa* for Thailand. *Himalusa* was previously known from the Himalayan region in Nepal where it was originally described. New data on bionomics and distribution are provided, including a discussion on the potential use of this species in the biological control of weeds in the United States. A short diagnosis, description, colour habitus images of adult and larva, and black and white genital images are provided. A key to the world species of *Himalusa* is also given. A new tribe Himalusini Klimaszewski, Pace & Center, is erected to accommodate *Himalusa* species.

Copyright *Her Majesty the Queen in the Right of Canada.* This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Keywords
Himalusa, Aleocharinae, Coleoptera, Thailand, new species, phytophagous, biological control, weeds, *Paederia pilifera*, sewer vine

Introduction

Himalusa Pace (2006) was previously known from a single species, *H. annapurnensis* Pace, described from the Annapurna region of the Himalayas, Nepal. Recently, an additional undescribed species of the same genus was discovered in Thailand. This constitutes the first generic records of *Himalusa* in Thailand. Adults of the new species were observed feeding on *Paederia pilifera* Hook. f. (Rubiales: Rubiaceae), by gnawing little holes in plant leaves and scraping the plant tissue using their mandibles. This may be the first confirmed record of Staphylinidae/Aleocharinae species feeding on live plant tissues. Most aleocharine species are predators of other small arthropods. The purpose of this paper is to describe a new species of *Himalusa* from Thailand, and to enhance further studies of this beetle, which has the potential to be a biological control agent of *Paederia foetida* L. and *P. cruddasiana* Prain, invasive environmental weeds in the southern United States.

Material examined

Sixteen adults of *Himalusa* representing a new species were found in Thailand. All specimens were dissected. The genital structures were dehydrated in absolute alcohol and mounted in Canada balsam on celluloid microslides and pinned with the specimens from which they originated. The photographs of the body images (Figs 1, 2, 17) and the genital structures were taken using an image processing system (Nikon SMZ 1500 stereoscopic microscope; Nikon digital camera DXM 1200F; Nikon View 5 COOLPIX NSA, Version 5.1.2, and Adobe Photoshop software). The colour images of entire beetles (Figs 26–29) were generated using an image processing system consisting of a Wild M420 stereomicroscope (Leica), SPOT™ RT™ Slider camera (Diagnostic Instruments) and Adobe Photoshop software.

Terminology mainly follows that used by Pace (2006) and Seevers (1978). The ventral part of the median lobe of the aedeagus is considered to be that with the foramen mediale of the bulbus with ductus ejaculatorius and the opposite side is considered as the dorsal part.

Institutional abbreviations:

IPRL Invasive Plant Research Laboratory, Agricultural Research Service, United States Department of Agriculture, Fort Lauderdale, Florida, U.S.A.

LFC Natural Resources Canada, Canadian Forest Service, Laurentian Forestry Centre, Insectarium R. Martineau, Quebec City, Quebec, Canada

Tribe Himalusini Klimaszewski, Pace & Center, trib. n.
urn:lsid:zoobank.org:act:875B2C4A-2170-4A1E-A14F-CD8F40E4DE3D
Type genus: *Himalusa* Pace, 2006

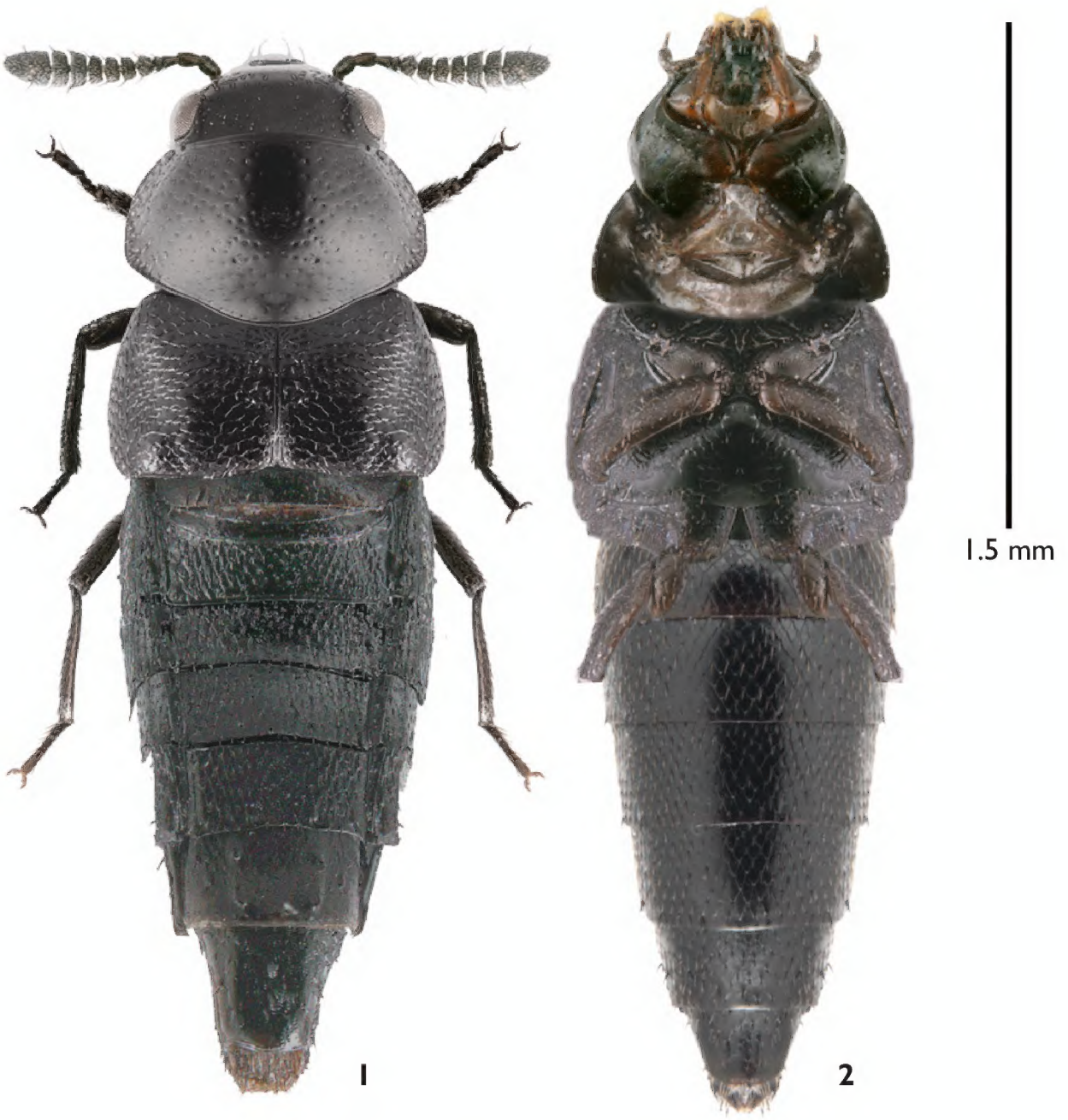
Diagnosis. The following unique combination of characters is characteristic of this tribe: tarsal formula 4-4-5; maxillary palpi with four articles and a pseudosegment (Fig. 7, 7b); ligula in the form of a small lobe (Fig. 8); labial palpi with two articles and a very short pseudosegment (Fig. 8); median lobe of aedeagus slightly asymmetrical (Figs. 12, 21), uniquely shaped structures of internal sac of the median lobe of aedeagus and rigid flagellum (Figs. 11, 12, 20, 21), and unique form of the apical lobe of paramere, which is attached medially to the paramerite, is very long and has serrate internal edge (Figs. 13, 22).

Remarks. Pace (2006) affiliated *Himalusa* with the tribe Homalotini Heer, and suspected a possible link between *Himalusa* and the genus *Placusa* Erichson [now placed in a separate tribe Placusini Mulsant and Rey], on the grounds of similar morphology of labial palpi, ligula, and some genital features. The general robust body form of *Himalusa* and the presence of pseudosegments on the last articles of maxillary and labial palpi are similar to those in the genus *Aleochara* Gravenhorst and *Tinotus* Sharp of Aleocharini Fleming, and the genera of Hoplandriini Casey. Majority of Aleocharini taxa have 5-5-5 articulated tarsi and *Tinotus* and Hoplandriini have 4-5-5 tarsal formula. A future phylogenetic study is needed to reveal the true relationship of Himalusini to the other aleocharine tribes, mainly Aleocharini, Homalotini, Hoplandriini and Placusini.

***Himalusa* Pace, 2006**
Figs. 1–29

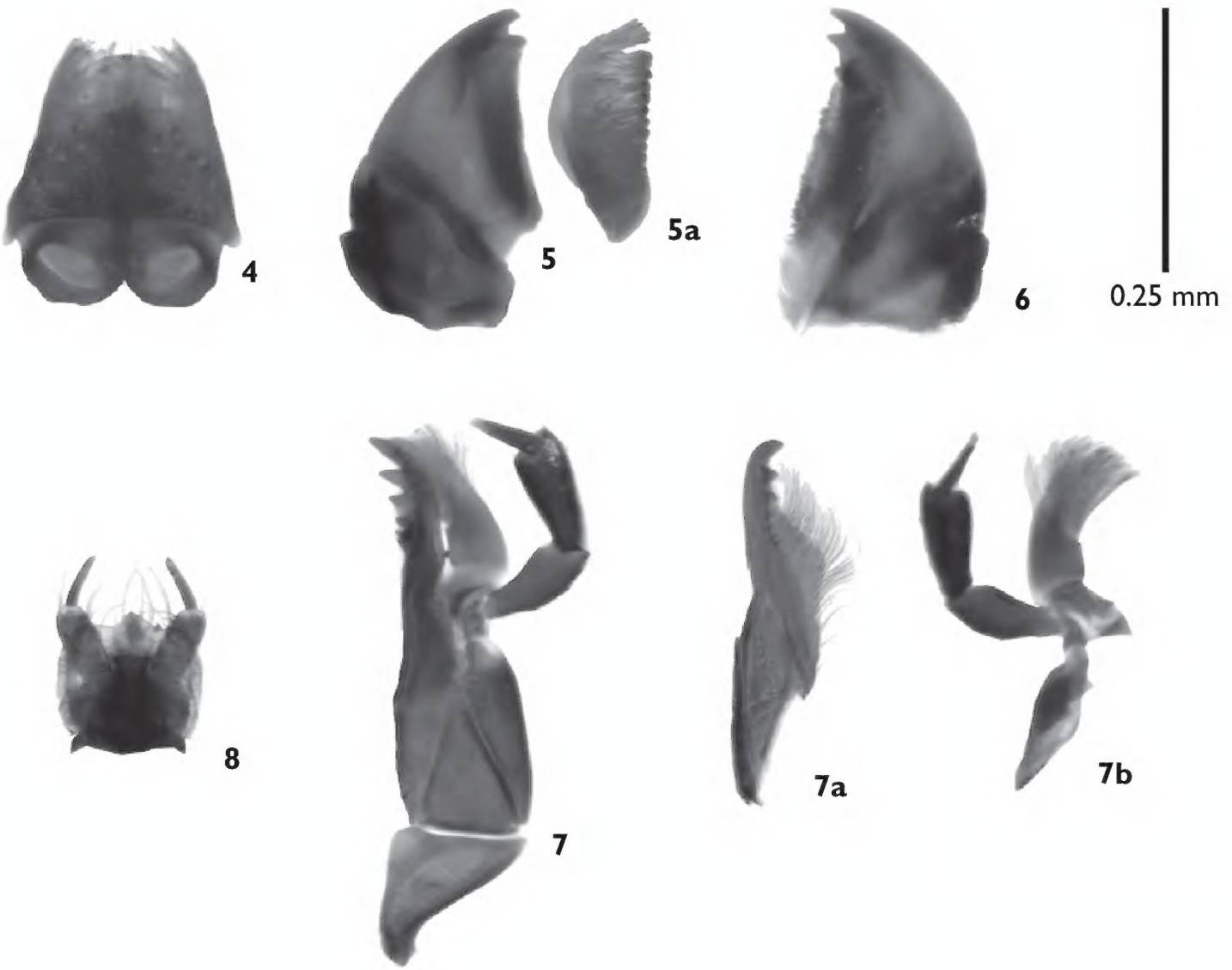
Type species: *Himalusa annapurnensis* Pace, 2006, by original designation.

Diagnosis. *Himalusa* may be distinguished from other aleocharine genera by the following combination of characters: body broad, robust, heavily sclerotized, glossy, sparsely punctate and sparsely pubescent (Figs. 1, 17); head large with pronounced eyes (Figs. 1, 17); antennae with antennomeres 5–11 transverse and incrassate (Figs. 1, 17); labrum elongate (Fig. 4); mandibles strong, each with one large subapical tooth and well-developed hairy molar plate (Figs. 5–5a), maxillae well developed, galea with long apical hairs (Figs. 7, 7a,b), lacinia with several large triangular teeth near the apex (Figs. 7, 7a), maxillary palpi with 4 articles, last one with pseudosegment (Figs. 7, 7b); ligula short, entire and in the form of a small lobe (Fig. 8); labial palpi with 2 articles and with minute apical pseudosegment (Fig. 8); pronotum strongly transverse and strongly convex dorsoapically (Figs. 1, 17); elytra and abdomen with scale-shaped microsculpture (Figs. 1, 17); elytra at base shorter than pronotum (Figs. 1, 17); abdomen tapering apically (Fig. 1); procoxae elongate, projecting and broadly separated, their cavities round and small (Fig. 2); mesocoxae oval in shape, flattened, and narrowly separated (Figs. 2, 3), mesov-



Figures 1, 2. *Himalusa thailandensis* Pace, Klimaszewski & Center, sp. n.: **1** dorsal view, and **2** ventral view.

Figure 3. *Himalusa thailandensis* Pace, Klimaszewski & Center, sp. n.: ventral view of meso-metathorax and first ventrite.



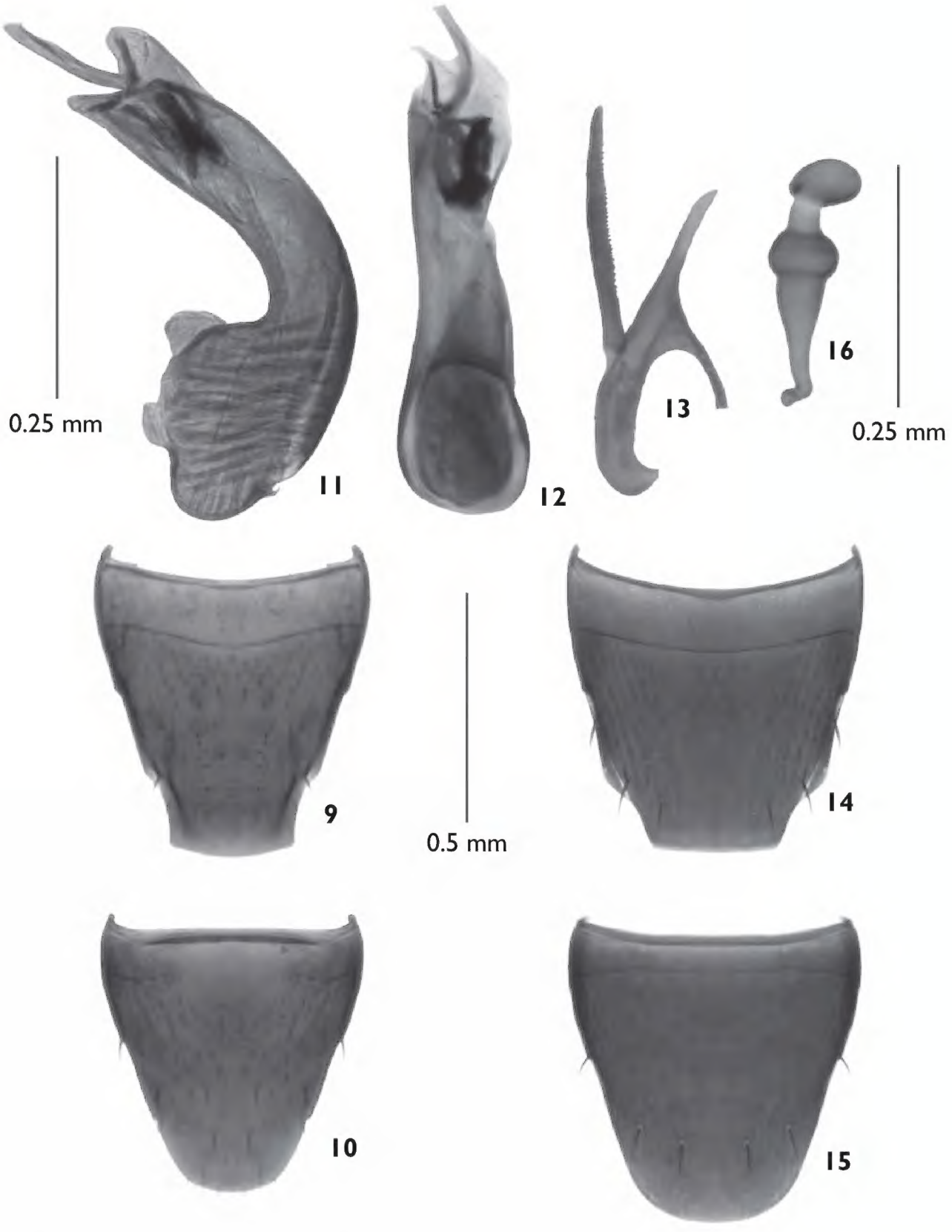
Figures 4–8. *Himalusa thailandensis* Pace, Klimaszewski & Center, sp. n., mouthparts: **4** labrum **5** left mandible **5a** molar structure **6** right mandible **7** maxilla **7a** lacinia and part of the galea **7b** maxillary palpus with galea **8** labial palpi and ligula.

entrite narrowly V-shaped and reaching one fifth of the mesocoxal length, isthmus short (Fig. 3); metacoxae transverse and nearly in contact medially (Fig. 3).

Key to *Himalusa* species of the world

1. Body broadly oval (Fig. 1); basal antennomeres black; base of pronotum approximately as broad as apex of elytra (Fig. 1); elytra at suture shorter than pronotum (Fig. 1); median lobe of aedeagus moderately narrow and moderately strongly curved, broader at base and gradually narrowing apically (Figs. 11, 12, 20, 21); known from Thailand..... ..... ***H. thailandensis* Pace, Klimaszewski & Center, sp. n.**

– Body narrowly elongate (Fig. 74 in Pace 2006); basal antennomeres reddish; base of pronotum narrower than apex of elytra (Fig. 74 in Pace 2006); elytra at suture about as long as pronotum (Fig. 74 in Pace 2006); median lobe of aedeagus narrow and very strongly curved, narrow at base and broadest in apical third (Figs. 75, 76, in Pace 2006); known from Himalayan region in Nepal..... ***H. annapurnensis* Pace**



Figures 9–16. *Himalusa thailandensis* Pace, Klimaszewski & Center, sp. n., genital structures: **9** male tergite 8 **10** male sternite 8 **11** median lobe of aedeagus in lateral view **12** median lobe of aedeagus in dorsal view **13** paramere **14** female tergite 8 **15** female sternite 8 **16** spermatheca.

***Himalusa thailandensis* Pace, Klimaszewski & Center, sp. n.**
urn:lsid:zoobank.org:act:3B79AEE2-166E-47F3-BA24-262A8B2897FE
Figs. 1–29

HOLOTYPE (male): THAILAND, Lampang Province, Sop Prap District, N17°84'20.8" E99°20'33.3", 22.VII.2009, coll. R.W. Pemberton; feeding on *Paederia*

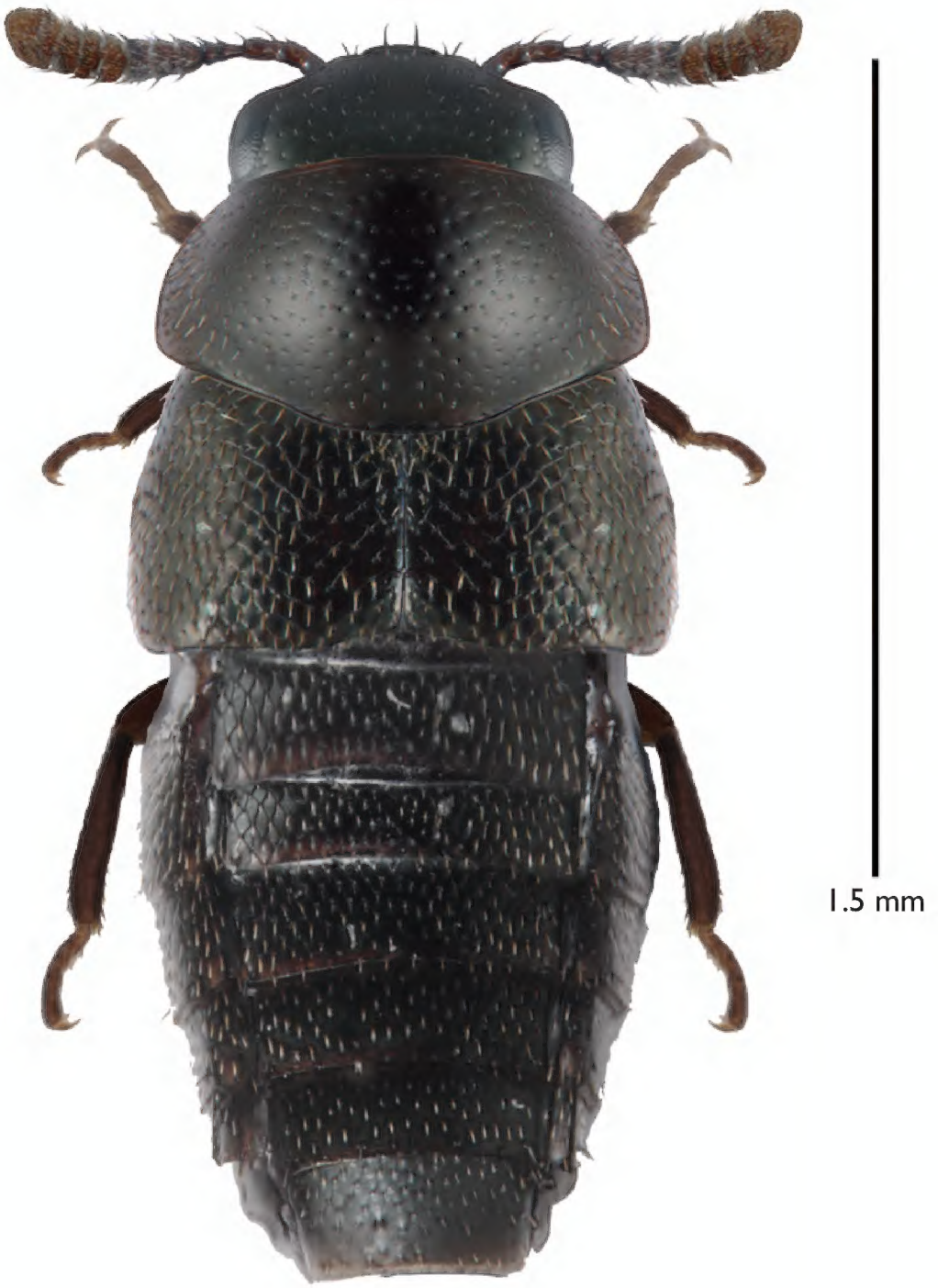


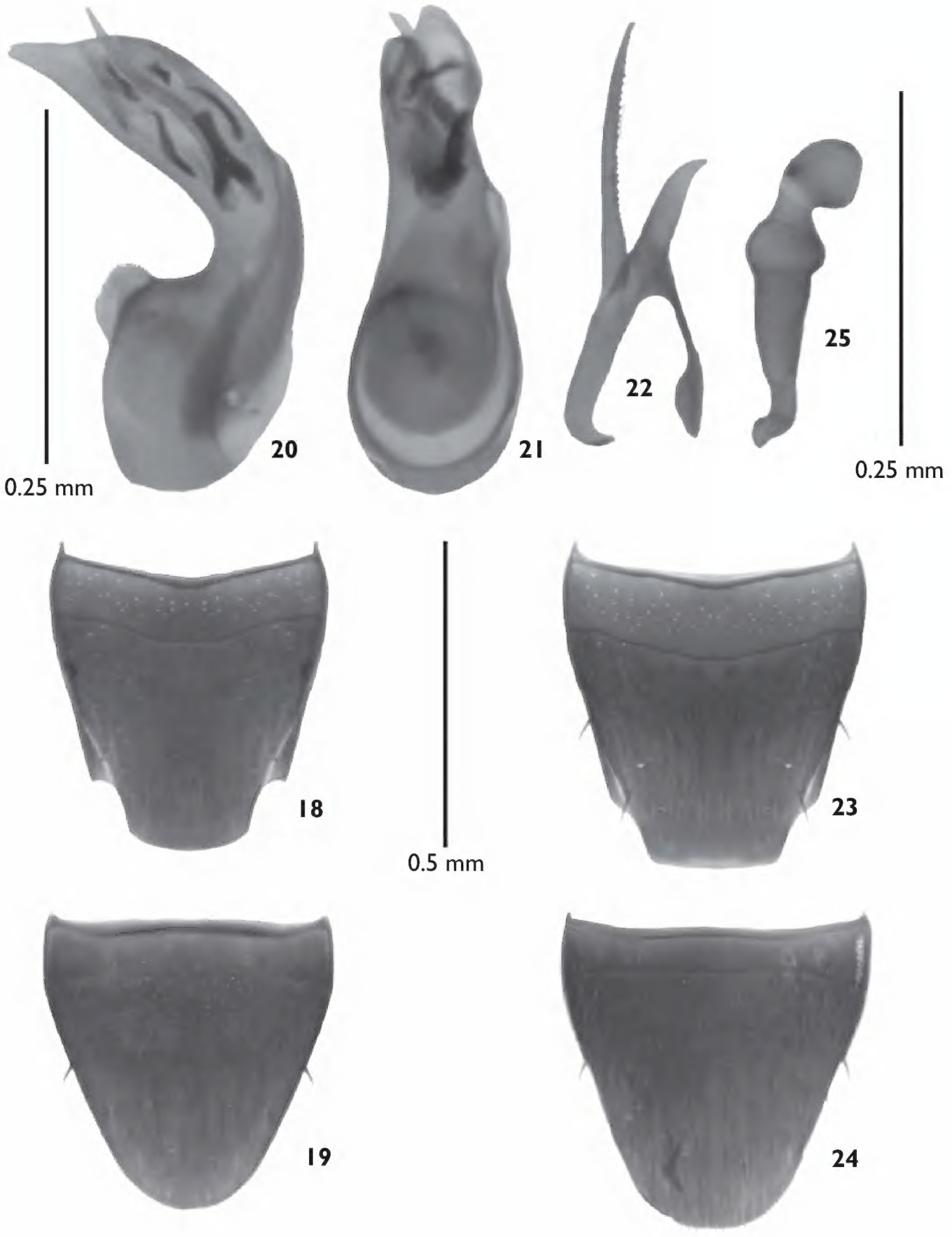
Figure 17. *Himalusa thailandensis* Pace, Klimaszewski & Center, sp. n., small body form, in dorsal view (apex of abdomen removed).

pilifera (LFC). **PARATYPES**: all labelled as the holotype (LFC) 2 males, 2 females, (IPRL) 2 males, 4 females.

NON-TYPES: these specimens are excluded from the type series on the grounds of smaller size but are considered as infraspecific variation of *H. thailandensis*: THAILAND, Prachuap Kin Kan Province, main highway, roadside heading north, Lat. 11°43.387'N, Long. 99°43.532'W, 21.IV.2009, A.D. Wright, staphylinid adults on *Paederia* sp. (LFC) 2 males, 1 female, (IPRL) 2 females.

Etymology. The specific name is a feminine adjective derived from the country name Thailand, where the type series was found.

Diagnosis. It differs externally from *H. annapurnensis* Pace by more robust body, more transverse pronotum, and tapering abdomen (Figs. 1, present paper, and 74 in



Figures 18–25. *Himalusa thailandensis* Pace, Klimaszewski & Center, sp. n., small body form, genital structures: **18** male tergite 8 **19** male sternite 8 **20** median lobe of aedeagus in lateral view **21** median lobe of aedeagus in dorsal view **22** paramere **23** female tergite 8 **24** female sternite 8 **25** spermatheca.

Pace 2006), and genitally with the tubus of the median lobe of the aedeagus being less convex in lateral view (Figs. 10, present paper, and 74 in Pace 2006).

Description. Body length 2.5–3.0 mm, robust and compact, strongly sclerotized, strongly glossy, sparsely punctate, elytra and abdomen with pronounced scale-shaped

Figures 26, 27. *Himalusa thailandensis* feeding on *Paederia* sp. leaf

microsculpture; body proportions: maximum width of pronotum to maximum width of head (1.3); maximum width of pronotum to its length (2.0); maximum width of elytra to length at suture (2.4); abdomen tapering apically (Fig. 1); legs moderately elongate. *Male.* Tergite 8 truncate apically (Figs. 9, 18); sternite 8 rounded apically

Figure 28. *Himalusa thailandensis*: a swollen petiole of *Paederia* sp. leaf that contains a larva.

Figure 29. *Himalusa thailandensis*: a larva that emerged from a swollen petiole of *Paederia* sp. leaf.

(Figs. 10, 19); median lobe of aedeagus with broadly arcuate venter of tubus in lateral view (Figs. 11, 20), and asymmetrical tubus in dorsal view (Figs. 12, 21), internal sac structures as illustrated (Figs. 11, 12, 20, 21); paramere with long styliform apical lobe bearing serrate internal edge (Figs. 13, 22). *Female.* Tergite and sternite 8 similar to those of male (Figs. 14, 15, 23, 24); spermatheca with approximately spherical capsule connected to narrow neck, swelled chamber and posterior stem (Figs. 16, 25).

Distribution. Adult specimens were collected from Lampang and Prachuap Kin Kan provinces, both in Thailand.

Comments. The specimens from Prachuap Kin Kan Province were excluded from the paratype series of *Himalusa thailandensis* on the grounds of smaller body (length 1.9–2.0 mm) and slight differences in the median lobe of aedeagus and spermatheca (Figs. 20, 21, 25). We consider these differences as infraspecific variations. Should further molecular studies prove the opposite, the status of this form should be reconsidered.

Collection and habitat data

Adults were captured in July (by type material) and April (by non-type material) feeding on skunkvine - *Paederia pilifera* Hook. f. (Rubiales: Rubiaceae). Closely related species are invasive weeds in the southern United States.

The adult beetles feed on the upper leaf surfaces of *P. pilifera*, parallel to a leaf vein, most often the mid-vein, where they excavate oblong holes completely through the leaf (Figs. 26, 27). These holes conform to the size of their bodies. The adults often nestle within them and, when disturbed, exit through to the underside of the leaf. They also scrape the lateral laminar surfaces causing an irregular skeletonized pattern. The leaf tissues adjacent to the feeding sites blacken and necrosis follows. This produces significant levels of foliar damage. The larvae burrow and feed within the leaf petioles. As they grow, the petioles swell and become almost gall-like. At some point, the petiole splits and the larva drops out. The images show a swollen petiole that contains a larva (Fig. 28), and the larva that emerged from it (Fig. 29). Pupation probably occurs in the soil or under leaf litter. Other aspects of their biology are unknown and merit further investigation.

Acknowledgements

We thank Natural Resources Canada for supporting this project under the Biodiversity Program. We appreciate the assistance of Pamela Cheers (LFC) for editing the manuscript. Our colleague, Munetoshi Maruyama, National Science Museum, Tokyo, Japan, shared our interesting discussions regarding the potential relationship of *Himalusa* to other aleocharine taxa. We are extremely grateful to Amporn Winotai (Thailand Department of Agriculture) and Tony Wright (CSIRO, Australia) for invaluable field work in Thailand, for specimens, and for biological observations. We thank Bob Pemberton (IPRL) for providing specimens.

References

Pace R (2006) Aleocharinae del Nepal al Naturkundemuseum di Erfurt (Insecta: Coleoptera: Staphylinidae). In: Hartmann M, Weipert J (Eds) Biodiversität und Naturausstattung im Himalaya II. Verein der Freunde und Förderer des Naturkundemuseums Erfurt e.V., Erfurt: 343–408.

Seevers CH (1978) A generic and tribal revision of the North American Aleocharinae (Coleoptera: Staphylinidae). Fieldiana Zoology 71: I–VI, 1–289.